1. A method of gating radiation for a computed tomography procedure, comprising:

 measuring a first set of signal data representative of a physiological movement of a patient during a first time period;

 pattern matching the first set of signal data with a second set of signal data related to measured physiological movement of a patient during a second time period to identify degree of deviation from periodicity of the physiological movement; and

 gating radiation to the patient if the degree of deviation from periodicity exceeds a threshold based upon results of the pattern matching.

17. A method for gating an execution of a medical procedure, comprising:

 collecting data samples for a physiological movement; analyzing the data samples to identify deviation from periodicity; and

 gating an execution of the medical procedure if deviation from periodicity is identified;

 wherein the act of gating the execution of the medical procedure comprises gating the application of radiation.

20. A method for gating an execution of a medical procedure, comprising:

 collecting data samples for a physiological movement; analyzing the data samples to identify deviation from periodicity; and

 gating an execution of the medical procedure if deviation from periodicity is identified;

 wherein the act of gating the execution of the medical procedure comprises gating of data acquisition, and the medical procedure comprises an emission imaging method.

25. A method of gating the application of radiation for a CT procedure, comprising:

 measuring signal data representative of at least a portion of a physiological movement to form a set of ordered measurement samples;

 pattern matching the set of ordered measurement samples against prior measurement samples of the physiological movement to determine deviation from periodicity of the set of ordered measurement samples; and

 gating CT radiation to the patient if the deviation from periodicity is outside a threshold range.

37. A method of gating radiation, comprising:

 receiving a set of signal data representative of a physiological movement of a patient;

 estimating phase of the set of signal data; comparing a vector of the set of signal data with one or more prior sets of signal data to identify deviation from periodicity of the physiological movement, the vector of the set of signal data based upon the phase, the one or more prior sets relating to measured physiological movement of a patient during one or more prior time periods; and gating radiation to the patient if the deviation from periodicity is identified.

1. A method of gating the application of therapeutic radiation comprising:

 measuring a first set of signal data representative of a physiological movement of a patient during a first time period;

 pattern matching the first set of signal data with a second set of signal data related to measured physiological movement of a patient during a second time period to identify degree of deviation from periodicity of the physiological movement; and

 gating therapeutic radiation to the patient if the degree of deviation from periodicity exceeds a threshold.

17. A method of gating the application of radiation, comprising:

        measuring signal data representative of at least a portion of a physiological movement to form a set of ordered measurement samples;

        pattern matching the set of ordered measurement samples against prior measurement samples of the physiological movement to determine deviation from periodicity of the set of ordered measurement samples; and

        gating therapeutic radiation to the patient if the deviation from periodicity is outside a threshold range.

U.S. Patent No. 6,279,579

1. A method for positioning a patient comprising:

        determining reference positions for a plurality of body locations on a patient;

        manipulating one or more of the plurality of body locations of the patient so that relative positioning of the plurality of body locations corresponds to relative positioning of the reference positions; and

        maneuvering the patient so that absolute positioning for the plurality of body locations corresponds to absolute positioning for the reference positions.

12. A system for positioning a patient comprising:

        a plurality of markers located at particular body locations on the patient;

one or more marker detection apparatuses, each of the one or more marker detection apparatuses configured to output information indicative of the positions of the plurality of markers; and

        a computing device to receive the output information from the plurality of marker detection apparatuses, the computing device having a processor configured to:

        determine the location of the plurality of markers;

        determine reference positions for the particular body locations on the patient;

        provide instructions for manipulating one or more of the particular body locations on the patient so that relative positioning of the particular body locations corresponds to relative positioning of the reference positions; and

        provide instructions for maneuvering the patient so that absolute positioning of the particular body locations corresponds to absolute positioning of the reference positions.

U.S. Patent No. 6,690,965

1. A system for determining one or more treatment intervals for radiation therapy comprising:

        an imaging system for generating image data representative of an internal region of a patient's body;

        an instrument for generating motion information relating to physiological movement of the patient's body; and

        a user interface configured to synchronously display in a single display the image data with a motion signal chart the motion signal chart presenting a representation of the motion information and representing physiological movement during a measurement time period; wherein the user interface is further configured for allowing a gating signal chart to be determined based on the image data and the motion signal chart, the gating signal chart representing one or more treatment intervals.

10. A system for determining one or more treatment intervals in a planning phase of a treatment, comprising:

        means for recording image data representative of internal tissue targeted for irradiation;

        means for generating motion data representative of physiological movement of a patient;

means for synchronously displaying in a single display the image data with a motion signal chart, the motion signal chart presenting a representation the generated motion data and representing physiological movement during a measurement time period; and means for determining a gating signal chart based on the image data and the motion signal chart, the gating signal chart representing one or more treatment intervals.

25. A method for determining one or more treatment intervals for radiation therapy comprising:

recording image data representative of internal tissue targeted for irradiation;

generating motion data representative of a physiological movement that occurs while image data is being recorded;

synchronously displaying the image data with a motion signal chart, the motion signal chart presenting a representation of the generated motion data and representing physiological movement during a measurement time period; and

determining a gating signal chart based on the image data and the motion signal chart, the gating signal chart representing one or more treatment intervals.

37. A method for determining one or more treatment intervals a planning phase of a treatment, comprising:

recording image data representative of internal tissue targeted for irradiation; generating motion data representative of physiological movement of a patient;

synchronously displaying the image data with a motion signal chart, the motion signal chart presenting a representation of the generated motion data and representing physiological movement during a measurement time period; and

determining a gating signal chart based on the image data and the motion signal chart, the gating signal chart representing one or more treatment intervals.

U.S. Patent No. 7,204,254

1. A marker system for use in a patient treatment system comprising:

a marker block having a surface;

a first reference location on the surface; a second reference location on the surface, and spaced apart from the first reference location; and

the first reference location and the second reference location positioned on the surface such that both reference locations are simultaneously detectable by an optical imaging apparatus.

6. A marker system, comprising.

a marker block having a surface; two or more reflective elements located on said surface, said two or more reflective elements having known positioning relative to each other, wherein one of said two or more reflective elements is spaced apart from another of said two or more reflective elements; and

said marker block positioned such that at least two of said two or more reflective elements are viewable by one or more optical imaging apparatus.

U.S. Patent No. 6,973,202

1. A method for tracking a location and orientation of an object in three-dimensional space, comprising:

(a) surveying a plurality of markers on an object;

(b) calibrating an imaging device that is used to image the object;

(c) obtaining a first set of object position and orientation data;

(d) projecting the markers to an image domain to obtain coordinates of projected markers;

(e) obtaining an image frame data set using the imaging device, the image frame data set comprising image data for at least three markers from the plurality of markers;

(f) analyzing the image frame data set against the projected marker coordinates;

(g) adjusting the first set of object position and orientation data if results of (f) are not within acceptable threshold tolerances; and

(h) accepting the first set of object position and orientation data for the object if results of (f) are within the acceptable threshold tolerances.

30. A single camera method for tracking a location and orientation of an object, comprising:

surveying a set of markers on an object; obtaining an estimate of the position and orientation of the object;

using a single camera to image the object to obtain an image frame to generate actual coordinate information, wherein at least three markers in the image frame are identifiable;

analyzing the actual coordinate information; and accepting the estimate of the position and orientation of the object if the result of analyzing the actual coordinate information is within an acceptable threshold tolerance.

U.S. Patent No. 6,980,679

1. A method of monitoring breathing activity, comprising:

measuring a first set of signal data representative of a breathing movement of a subject during a first time period;

pattern matching the first set of signal data with a second set of signal data related to measured breathing movement of the subject during a second time period to identify degree of deviation from periodicity of the breathing movement; and reporting irregularity based upon results of the pattern matching.

18. A method of monitoring object movement, comprising:

acquiring image data; determining a number of markers visible in the image data;

determining if the number of markers meets a threshold value; and reporting irregularity if the number of markers does not meet the threshold value.

26. A method of monitoring breathing activity, comprising:

receiving a set of signal data representative of a breathing movement of a subject;

estimating phase of the set of signal data; comparing a vector of the set of signal data with one or more prior sets of signal data to identify deviation from periodicity of the breathing movement, the vector of the set of signal data based upon the phase, the one or more prior sets relating to measured breathing movement of the subject during one or more prior time periods; and reporting irregularity based upon results of the comparison.

40. A method for monitoring regular activity, comprising:

co-locating a marker block with an object such that movement of the marker block relates to movement of the object, the marker block comprising one or more markers;

viewing the marker block with a camera; generating image data representative of the marker block; and

reporting irregularity based upon insufficient periodicity for detected movement.

51. A system for monitoring breathing activity, comprising:

means for measuring a first set of signal data representative of a breathing movement of a subject during a first time period; means for pattern matching the first set of signal data with a second set of signal data related to measured breathing movement of the subject during a second time period to identify degree of deviation from periodicity of the breathing movement; and means for reporting irregularity based upon results of the pattern matching.

55. A system for monitoring object movement, comprising:

  means for acquiring image data; means for determining a number of markers visible in the image data;

  means for determination if the number of markers meets a threshold value; and

  means for reporting irregularity if the number of markers does not meet the threshold value.

59. A system for monitoring breathing activity, comprising:

  means for receiving a set of signal data representative of a breathing movement of a subject;

  means for estimating phase of the set of signal data; means for comparing a vector of the set of signal data with one or more prior sets of signal data to identify deviation from periodicity of the breathing movement, the vector of the set of signal data based upon the phase, the one or more prior sets relating to measured breathing movement of the subject during one or more prior time periods; and

  means for reporting irregularity based upon results of the comparison.

63. A system for monitoring regular activity, comprising:

  means for co-locating a marker block with an object such that movement of the marker block relates to movement of the object, the marker block comprising one or more markers; means for viewing the marker block with a camera; means for generating image data representative of the marker block; and

  means for reporting irregularity based upon insufficient periodicity for detected movement.

U.S. Patent No. 7,123,758

1. A method of monitoring breathing activity, comprising:

  using an optical device to obtain a set of signal data representative of a breathing movement of a first patient during a time period;

  comparing amplitude of the set of signal data with a threshold; and

  reporting irregularity based upon a result of the comparison.

13. A system for monitoring breathing activity, comprising:

  an optical device for measuring a set of signal data representative of a breathing movement during a time period;

  means for comparing amplitude of the set of signal data with a threshold; and

  means for reporting irregularity based upon a result of the comparison.

21. A computer program product that includes a medium usable by a processor, the medium having a set of instructions, an execution of which by a processor will cause a process to be performed, the process comprising:

  obtaining a set of signal data representative of a breathing movement during a time period, wherein the step of obtaining is performed using an optical device;

  comparing amplitude of the set of signal data with a threshold; and

  reporting irregularity based upon a result of the comparison.

U.S. Patent No. 6,959,266

1. A method of gating an application of radiation, comprising:

  obtaining a first set of data representative of a physiological movement of a patient during a first time period;

  obtaining a second set of data related to a measured physiological movement of the patient during a second time period;

  comparing the first set of data with a second set of data; and

gating an application of radiation to the patient based on a result of the comparing.

19. A method for gating an execution of a procedure, comprising:
    determining a variable representative of a degree of completion of a cycle of a physiological movement; and gating an execution of a procedure based upon the variable.

U.S. Patent No. 7,191,100

1. A method of generating a signal, comprising:
    determining a variable representative of a degree of completion of a cycle of a physiological movement; and
    generating a signal based upon the variable; wherein the variable is determined using a first set of data obtained at a first time and a second set of data obtained at a second time.

21. A system for determining a signal, comprising:
    a processor configured to determine a variable representative of a degree of completion of a cycle of a physiological movement, and generate a signal based upon the variable;
    wherein the processor determines the variable using a first set of data obtained at a first time and a second set of data obtained at a second time.

22. A method of performing a procedure, comprising:
    determining a variable representative of a degree of completion of a cycle of a physiological movement; and
    using the variable in the procedure; wherein the variable is determined using a first set of data obtained at a first time and a second set of data obtained at a second time.

U.S. Patent Application No. 10/957,009

54.   A method of prompting a patient, comprising:
    obtaining data for informing a patient of a first target result desired to be achieved, and a period within which the first target result is desired to be achieved; and
    displaying a graphic using the data to inform the patient of the first target result and the period.

60.   A computer program product that includes a medium, the medium comprises a set of instructions, an execution of which causes a process to be performed, the process comprising:
    obtaining data for informing a patient of a target result desired to be achieved, and a period within which the target result is desired to be achieved; and
    displaying a graphic using the data to inform the patient of the target result and the period.

65.   A system for prompting a patient, comprising:
    a processor configured to generate data for informing a patient of a target result desired to be achieved, and a period within which the target result is desired to be achieved; and
    a screen for displaying a graphic using the data to inform the patient of the target result and the period.

70.   A user interface for prompting a patient, comprising:
    a screen displaying a graphic for informing a patient of a target result desired to be achieved, and a period within which the target result is desired to be achieved.

75.   A method of prompting a patient, comprising:

generating data for informing a patient of a first target result desired to be achieved at a prescribed future time; and

displaying a graphic using the data to inform the patient of the target result before the prescribed time is reached.

83. A computer program product that includes a medium, the medium comprises a set of instructions, an execution of which causes a process to be performed, the process comprising:

generating data for informing a patient of a target result desired to be achieved at a prescribed future time; and

displaying a graphic using the data to inform the patient of the target result before the prescribed time is reached.

89. A user interface for prompting a patient, comprising:

a screen displaying a graphic for informing a patient of a target result desired to be achieved at a prescribed future time;

wherein the graphic is displayed before the prescribed future time is reached.

U.S. Patent Application No. 11/105,884

2. A method for determining a location of a point on a device, comprising:

determining a relationship between a plurality of reference points and at least one point on the device;

determining coordinates of the plurality of reference points; and

determining a coordinate of the at least one point based at least in part on the determined relationship and the coordinates of the plurality of reference points.

9. A method for profiling an object, comprising:

tracing a pointer device tip along a path on an object;

determining a set of marker positions associated with the pointer device tip; and

determining coordinates of the pointer device tip based on the determined set of marker positions.

12. A method for determining a position of an object, comprising:

performing an imaging procedure to acquire imaging data for an internal region of a patient;

determining a location of at least one point in the image data, the location determined in reference to a first coordinate system;

optically determining a position of the object in a second coordinate system; and

determining a position of the object relative to the location of the at least one point in the first coordinate system.

18. A computer program product that includes a medium usable by a processor, the medium comprising a set of instructions which, when executed by the processor, causes a process to be performed, the process comprising:

determining a relationship between a plurality of reference points and at least one point on a device;

determining coordinates of the plurality of reference points; and

determining a coordinate of the at least one point based at least in part on the determined relationship and the coordinates of the plurality of reference points.

19.   A computer program product that includes a medium usable by a processor, the medium comprising a set of instructions which, when executed by the processor, causes a process to be performed, the process comprising:

        tracing a pointer device tip along a path on an object;

        determining a set of marker positions associated with the pointer device tip; and

        determining coordinates of the pointer device tip based on the determined set of marker positions.

20.   A computer program product that includes a medium usable by a processor, the medium comprising a set of instructions which, when executed by the processor, causes a process to be performed, the process comprising:

        performing an imaging procedure to acquire imaging data for an internal region of a patient;

        determining a location of at least one point in the image data, the location determined in reference to a first coordinate system;

        optically determining a position of the object in a second coordinate system; and

        determining a position of the object relative to the location of the at least one point in the first coordinate system.

21.   A system for digitizing a location of a point on a device in three-dimensional space, comprising:

        means for determining a relationship between a plurality of reference points and at least one point on the device;

        means for determining coordinates of the plurality of reference points; and

        means for determining a coordinate of the at least one point based at least in part on the determined relationship and the coordinates of the plurality of reference points.

22.   A system for three-dimensional profiling of an object, comprising:

        means for tracing a pointer device tip along a path on an object;

        means for determining a set of marker positions associated with the pointer device tip; and

        means for determining coordinates of the pointer device tip based on the determined set of marker positions.

23.   A system for determining a position of an object, comprising:

        means for acquiring imaging data for an internal region of a patient;

        means for determining a location of at least one point in the image data, the location determined in reference to a first coordinate system;

        means for determining a position of the object in a second coordinate system; and

        means for determining a position of the object relative to the location of the at least one point in the first coordinate system.

U.S. Patent Application No. 11/116,699

1.   A method for use with a radiation procedure, comprising:

        obtaining a first respiratory phase of a respiratory cycle;

        obtaining a second respiratory phase of the respiratory cycle; and

        generating a signal;

        wherein the signal has a start point that corresponds with the first respiratory phase, and an end point that corresponds with the second respiratory phase.

10.   A computer program product includes a computer-readable medium, the computer-readable medium having a set of stored instructions, an execution of which causes a process to be performed, the process comprising:

obtaining a first respiratory phase of a respiratory cycle;

obtaining a second respiratory phase of the respiratory cycle; and

generating a signal;

wherein the signal has a start point that corresponds with the first respiratory phase, and an end point that corresponds with the second respiratory phase.

11. A system for use in a radiation procedure, comprising:

means for obtaining a first respiratory phase of a respiratory cycle;

means for obtaining a second respiratory phase of the respiratory cycle; and

means for generating a signal;

wherein the signal has a start point that corresponds with the first respiratory phase, and an end point that corresponds with the second respiratory phase.

12. A method for use with a radiation procedure, comprising:

obtaining a respiratory phase of a respiratory cycle;

obtaining a width; and

generating a signal;

wherein the signal has a start point and an end point, the start point corresponding with the respiratory phase, and a duration between the start point and the end point corresponding with a duration of the width.

19. A computer program product includes a computer-readable medium, the computer-readable medium having a set of stored instructions, an execution of which causes a process to be performed, the process comprising:

obtaining a respiratory phase of a respiratory cycle;

obtaining a width; and

generating a signal;

wherein the signal has a start point that corresponds with the respiratory phase, and is configured to activate a radiation source for a duration of the width.

20. A system for use in a radiation procedure, comprising:

means for obtaining a respiratory phase of a respiratory cycle;

means for obtaining a width; and

means for generating a signal;

wherein the signal has a start point that corresponds with the respiratory phase, and is configured to activate a radiation source for a duration of the width.

21. A method for use in a radiation procedure, comprising:

collecting a first set of data representative of a respiratory motion of a patient;

obtaining a second set of data representative of a reference respiratory motion;

performing an analysis using the first and the second sets of data to determine whether the respiratory motion deviates from the reference respiratory motion; and

generating a signal based at least on a result of the step of performing.

30. A computer program product includes a computer-readable medium, the computer-readable medium having a set of stored instructions, an execution of which causes a process to be performed, the process comprising:

collecting a first set of data representative of a respiratory motion of a patient;

obtaining a second set of data representative of a reference respiratory motion;

performing an analysis using the first and the second sets of data to determine whether the respiratory motion deviate from the reference respiratory motion; and

generating a signal based at least on a result of the step of performing.

31. A system for use in a radiation procedure, comprising:
means for collecting a first set of data representative of a respiratory motion of a patient;
means for obtaining a second set of data representative of a reference respiratory motion;
means for performing an analysis using the first and the second sets of data to determine whether the respiratory motion deviate from the reference respiratory motion; and
means for generating a signal based at least on a result of the step of performing.

U.S. Patent Application No. 11/580,696

60. A method for monitoring subject(s), comprising:
acquiring image data; and
generating a signal when one or more markers cannot be detected from the image data.

61. A computer program product that includes a medium usable by a processor, the medium having a set of instructions, an execution of which by a processor will cause a process to be performed, the process comprising:
acquiring image data; and
generating a signal when one or more markers cannot be detected from the image data.

62. A method of monitoring a subject, comprising:
using an optical device to obtain an image of the subject;
analyzing the image to determine a number of marker(s);
comparing the number of markers with a prescribed value; and
generating a signal when the number of markers is less than the prescribed value.

69. A system for monitoring a subject, comprising:
an optical device for obtaining an image of the subject; and
a processor configured for:
analyzing the image to determine a number of marker(s);
comparing the number of markers with a prescribed value; and
generating a signal when the number of markers is less than the prescribed value.

74. A computer program product that includes a medium usable by a processor, the medium having a set of instructions, an execution of which by a processor will cause a process to be performed, the process comprising:
using an optical device to obtain an image of a subject;
analyzing the image to determine a number of marker(s);
comparing the number of markers with a prescribed value; and
generating a signal when the number of markers is less than the prescribed value.

80. A system for monitoring subject(s), comprising:
an optical device for obtaining an image of the subject; and
a processor configured for:
acquiring image data; and
generating a signal when one or more markers cannot be detected from the image data.

1.   A method for generating one or more images, comprising:
        collecting data samples representative of a motion of an object;
        acquiring image data of at least a part of the object over a time interval;
        synchronizing the data samples and the image data to a common time base; and
        generating one or more images based on the synchronized image data.

15.   A system for generating one or more images, comprising:
        means for collecting data samples representative of a motion of an object;
        means for acquiring image data of at least a part of the object over a time interval;
        means for synchronizing the data samples and the image data to a common time base; and
        means for generating one or more images based on the synchronized image data.

23.   A computer product having a set of stored instruction, the execution of which causes a process to
be performed, the process comprising:
        collecting data samples representative of a motion of an object;
        acquiring image data of at least a part of the object over a time interval;
        synchronizing the data samples and the image data to a common time base; and
        generating one or more images based on the synchronized image data.

30.   A method for generating one or more images, comprising:
        acquiring image data of at least a part of an object over a time interval;
        associating the image data with one or more phases of a motion cycle; and
        constructing one or more images using the image data that are associated with the respective one
or more phases.

56.   A method for processing image data, comprising:
        acquiring image data of at least a part of an object over a time interval; and
        binning the image data based on a characteristic of a motion of the object.

75.   A method for collecting image data, comprising:
        acquiring image data of at least a part of an object over a time interval; and
        sorting the image data based on a portion of a cycle of a motion of the object at which the image
data are acquired.